# Assignment Summary

For this assignment, you will create a diagram of DNA’s structure analyzing the components used to build DNA and how its structure is related to the function of DNA replication. Then you will create a flowchart documenting the steps of DNA replication and a graphic organizer to analyze the function of enzymes involved in the process. What you discover about DNA replication will be used to answer questions about predicting the consequences of errors in replication.

**Background Information**

The structure of DNA plays an important role in how DNA replication works. From its helical structure to the sugar-phosphate backbone, the components of DNA are related to the function of DNA replication. This assignment highlights this relationship first by diagramming the structure of DNA and then outlining the steps of DNA replication. From this part of the assignment you will explore how problems at the structural level of DNA can lead to errors with DNA replication.

**Materials**

* Internet
* Word processor
* Drawing materials
* Writing utensils

# Assignment Instructions

For this project, you are expected to submit 4 things:

1. Diagram of DNA structure.
2. Flowchart outlining the steps of DNA replication.
3. Graphic organizer showing functional purpose of enzymes involved in DNA replication
4. Responses to questions about errors in replicating DNA.

**Step 1: Prepare for the project.**

1. Read through the guide before you begin so you know the expectations for this project.
2. If there is anything that is not clear to you, make sure to ask your teacher.

**Step 2: Create a Diagram of DNA**

1. Draw the double helical structure of DNA on a separate sheet of paper.
2. Make sure the following components are included and properly labeled:
   1. Pentose sugar
   2. Phosphate group
   3. Nitrogenous bases – adenine, guanine, cytosine, and thymine
   4. Base pair
   5. Nucleotide
   6. 5’ and 3’ ends of the two DNA strands
3. Compare your structure to a reliable source that shows the structure of DNA such as: *https://www.genome.gov/about-genomics/fact-sheets/Deoxyribonucleic-Acid-Fact-Sheet*

**Step 3: Create a flowchart of DNA replication**

1. Research the process of how DNA replication occurs using a reliable source such as [*https://www.yourgenome.org/facts/what-is-dna-replication*](https://www.yourgenome.org/facts/what-is-dna-replication)
2. Identify the steps used by a cell to replicate DNA, beginning with the unwinding of DNA to when a complementary strand is made.
3. Create a flowchart using the steps identified to show the process of DNA replication. Make sure each step is clearly labeled and described.

**Step 4: Complete a graphic organizer about enzymes used in DNA replication**

1. Write down the enzymes involved in DNA replication.
2. Complete the **Graphic Organizer** below detailing the functional purpose for each enzyme.

**Step 5: Predict consequences of errors in replication by answering the following questions.**

1. Answer the questions in the **Written Analysis** section at the end of this document to predict the consequences of errors in replication:

**Step 6: Evaluate your project using this checklist.**

If you can check each box below, you are ready to submit your project.

* Did you draw a diagram structure of DNA?
* Is your diagram properly labeled?
* Did you select reliable sources to create your flow chart and graphic organizer?
* Did you include all necessary steps required to show the process of DNA replication in your flow chart?
* Does your graphic organizer include the enzymes DNA polymerase, ligase, helicase, topoisomerase and primase?
* Do your responses to the Written Analysis questions include supporting details to validate all explanations?

**Step 6: Revise and submit your project.**

1. If you were unable to check off all of the requirements on the checklist, go back and make sure that your project is complete. Be sure to save your project before submitting it.
2. Turn in your diagram, flow chart, graphic organizer, and responses to your teacher. Be sure that your name is on it.
3. Submit your diagram, flow chart, graphic organizer, and responses through the virtual classroom.
4. Congratulations! You have completed your project.

# Graphic Organizer

Complete the Graphic Organizer below. In the left column, list the enzymes used in the DNA replication process. Then state the purpose of each enzyme.

**DNA Enzymes Involved In Replication**

|  |  |
| --- | --- |
| **Enzyme** | **Purpose** |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

# Written Analysis

Answer each question below to predict consequences following DNA replication errors.

* 1. There is a mutation in the DNA polymerase that replaces the RNA primer on the lagging strand. How does this affect DNA synthesis?

* 1. A scientist quantifies the replication error rate during DNA replication. It is discovered that the error rate is greater in the lagging strand when compared to the leading strand. How is this possible? Use evidence from your flow chart and graphic organizer to justify your reason.
  2. What would be a potential consequence in DNA replication if helicase did not function properly?